The Norman Lockyer Observatory.

By PROF. H. H. TURNER, F.R.S.

CAN an observatory be run on the co-operative principle or as a joint stock company? The idea is a novel one, but it is the function of science to make experiments, and the tentative beginnings of the experiments in this directon are not unpromising.

The reasons for establishing an observatory at Salcombe Regis in the first instance need not, perhaps, at the present moment be recalled. Suffice it to recognise that the observatory exists, is well equipped with instruments and an excellent climate, and has an efficient, though small, working staff; it has, moreover, the advantage of association with a great name, the brightness of which promises to shine out more clearly as the dust of controversy is swept away by the fresh breezes of modern research.

Years before anyone else, Norman Lockyer suggested that there was an ascending and descending scale for stellar temperatures, which is now the orthodox modern view. It is true that the modern recognition of this characteristic of stellar evolution is based on grounds differing from those chosen by Lockyer for the erection of his theory, and the difference might have been vital. We owe Prof. Eddington a debt of gratitude for stating fearlessly that the difference is small compared with the sameness, and it is matter for congratulation that this recognition was forthcoming, if not actually in the presence of Sir Norman Lockyer, at any rate in the presence of his family, who were able to carry the account of it to him almost immediately. None of those who were present at the little gathering at Sidmouth which followed the meeting of the British Association at Bournemouth in 1919 are likely to forget it.

In the two years which have elapsed since that meeting events have moved quickly, at any rate in some ways. First, there has been at least one other visit of importance—Mr. and Mrs. Evershed were able to spend sufficient time at Salcombe Regis to report very favourably as to its observing climate. Their experience in judging climate is well known; we need only recall the expedition to Nelson (New Zealand) in connection with the offer of Mr. Cawthron to found a solar observatory, and the several expeditions to Kashmir with their varying fortunes. From these adventures has emerged the conviction that a moist climate is preferable to a dry—a conviction which, although at variance with some conclusions adopted in recent years, returns to the views of Sir William Herschel, who has recorded the magnificence of a night for observing when the dew had been so heavy that those who slept while he was at work could not believe on waking that there had not been heavy rain. The satisfaction of Mr. and Mrs. Evershed with Salcombe Regis is, therefore, in keeping with their previous conclusions; it seems even possible that when they leave Kodaikanal and return to England presently (an event which we shall regard with mixed feelings) they may even select Salcombe Regis for their next place of work; but that, of course, is still to be decided.

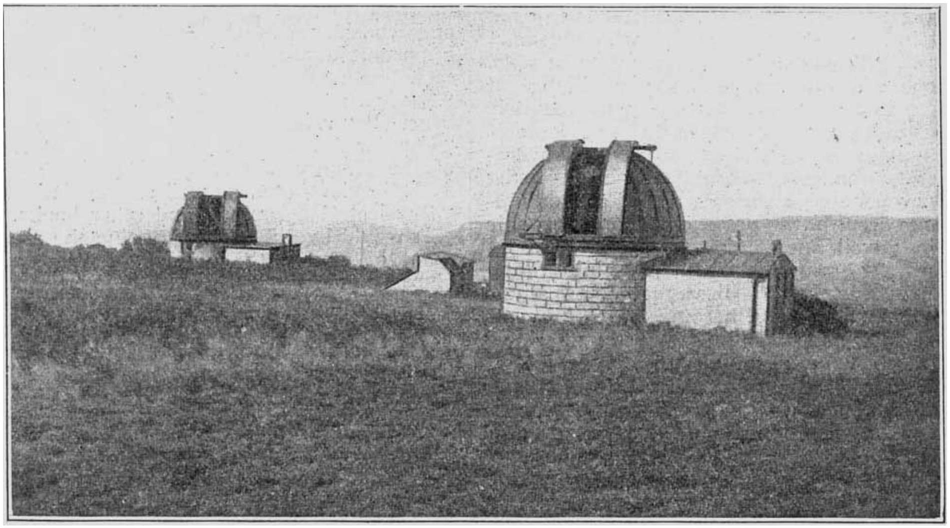


FIG. 1.—Norman Lockyer Observatory. The Frank McClean dome on the right and the Kensington dome on the left. View looking south-west.

Another visit to England, though not actually to the observatory itself, has been also attended with happy results. Mr. W. S. Adams, of Mount Wilson, was in England in 1919 on his way to and from the Brussels Conference; it was natural to consult him about the work of the Norman Lockyer Observatory, which at that time was limited to the taking of stellar spectra and classifying them on Lockyer's principle of classification. Adams suggested at once that it might be possible to measure the spectra in the manner he has developed for the determination of the absolute magnitude of a star, from which its distance might be deduced. This suggestion has been taken up at the observatory with very creditable success. It is obvious that to take up new work of this delicate kind involves much preliminary experiment; the method depends essentially on estimating the relative intensities of pairs of lines in the same spectrum, and the uncertainties attending estimates of intensity are well known; but these difficulties have been courageously faced. We may quote a sentence from the last report:—"A wedge has been designed and constructed for this purpose, and a preliminary series of measures made to test its suitability. This method of measuring relative intensities of the lines appears to be quite satisfactory, and two reports on the work which have been sent to the Research Committee have been commented upon very favourably."

Should this early promise be maintained, the observatory will have initiated a line of work new to England, and, indeed, so far as we know, new everywhere excepting at Mount Wilson. Meantime the former work of classification will not be neglected, and will possibly be extended by adding accurate determinations of the Harvard classification for comparison with those of the Lockyer classification. Such a systematic comparison must be of great value for arriving at a final standard system, whatever that may be.

It is a special pleasure to reflect that this work accords so closely with the ideas of the late Dr. Frank McClean, F.R.S., whose telescope has been presented to the observatory by his sons. Dr. McClean's own work in classification of spectra, especially for stars in the southern hemisphere, and his measurement of some of them by which he discovered for the first time the existence of oxygen in the stars, are matter of history; and it may safely be asserted that if he were alive to-day to make a choice he could scarcely have found work for his old telescope in closer conformity with that which it executed in his own capable hands.

His sons have throughout shown a filial interest in the observatory, and their share in the endowment of it has been very generous; but there are natural limits to private munificence, or at any rate to the purses of one or two individuals, and if the observatory is to prosper as it deserves, further help, which is urgently needed, must be sought for elsewhere; and this brings us back to the question with which we started—viz. Can an observatory, and especially can this particular observatory, be run as a joint enterprise? The idea was put forward first in June, 1914, but the war brought inevitable delays, so that only recently has it been possible to face the situation definitely.

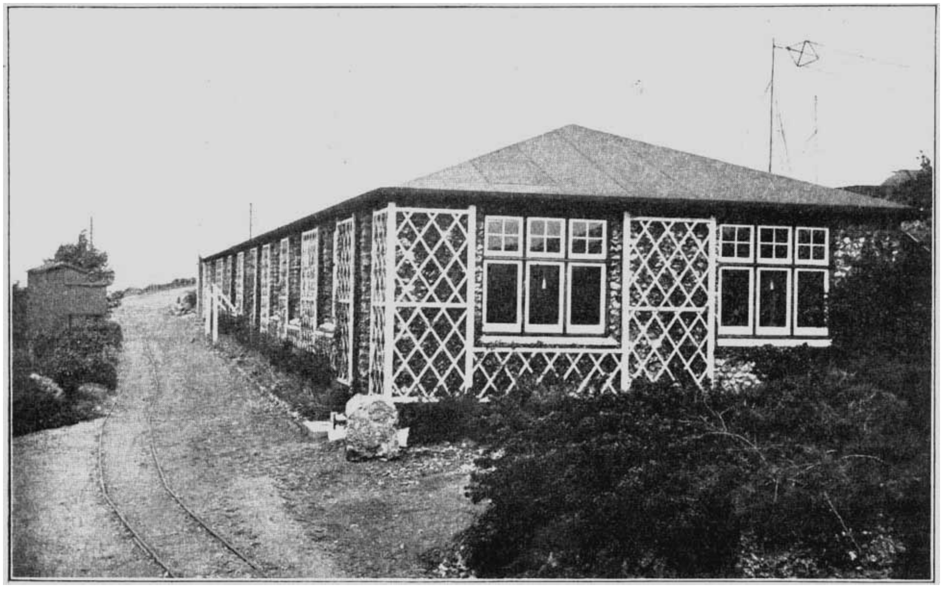


FIG. 2.—Norman Lockyer Observatory. Offices and terrace, looking north.

The quickest way to make clear the nature of the suggested new departure is to quote the following sentence from the little handbook compiled by Major Lockyer (6*d.*) giving an excellent account of the observatory: "Anyone can further the interests of the observatory by joining the corporation, either by subscribing a guinea a year, and thus becoming an annual member, or by paying 10*l.* and becoming a life member." Communications should be addressed to the honorary secretary, Capt. W. N. McClean, 1 Onslow Gardens, London, S.W.7. There are, of course, the executive council of thirteen names, and a research committee of four names (the Astronomer Royal and the professors of astronomy at Cambridge, South Kensington, and Oxford) prepared to give advice on scientific matters; there is also a most distinguished list of eight foreign members; but it is the hope and intention to make the direction as democratic as possible, if members of the corporation are ready to manifest an interest in the affairs of the observatory.

What are the prospects of such a novel method? A little reflection suggests at once a few directions in which advances may be made, and we may trust the future in this as in other scientific work to open up new avenues. We may begin with the well-known and widespread desire of many people to have opportunities of using a fairly large telescope; they cannot afford to possess one, and perhaps are not prepared, even if they could afford the instrument, to face permanent work with it; but they would welcome the possibility of work for a time with an instrument of some size which they need not purchase. Existing observatories can scarcely meet this desire; they have their own work to do, and their staffs are not generally more than sufficient to do it. Recently the Astronomer Royal has generously placed a large telescope at the disposal of some well-known amateurs on a special occasion, and it may be possible to extend this courtesy further; but it is an entirely new departure, and may find natural limits. At the Norman Lockyer Observatory there are as yet no limits to the possibilities, except the smallness of the staff, and should there prove to be a real demand for opportunities of work for a few months the arrangements are as yet fluid enough to meet the demand. Of course, the expenses must be met, just as must those of any other scientific society. At present the number of members of the corporation is limited by the constitution to three hundred, and it is obvious that the normal subscriptions, even when this limit is reached, which is not so yet, would be far from sufficient, without generous donations, for the upkeep of the observatory. If, however, the corporation could be extended to the dimensions of a scientific society, the question of expense might find an answer. It may be confidently asserted that those who made the experiment of working at the observatory for a week, or a month, or a year would enjoy the experience; Sidmouth itself is a well-known resort, and the observatory has a splendid outlook.

It is by no means necessary that the work selected by a visitor should be confined to night work. There are spacious offices and computing rooms, in which a piece of photographic measurement, or of computational work, or even literary work, could be carried on in pleasant and healthy surroundings.

There may be many who are desirous of the kind of holiday which will take them into new surroundings and yet can be combined with work which they could scarcely do in an hotel or in lodgings, or they possibly have some instrumental idea to be tested for which their own home scarcely provides a site. One of the conspicuous advantages of the Norman Lockyer Observatory is its splendid expanse of 7 acres, where even a large experiment could be conducted without interference with existing plant. The horizon is quite clear, the library and other buildings having been placed under the brow of the hill so as not to obstruct it.

The sight of this wonderful amount of space is enough to raise envious thoughts in the breasts of those who have to struggle with lack of room, and is apt to start various trains of thought. What is to happen to all our astronomical libraries, already full to overflowing, in twenty years' time? Shall we not be driven to the selection for preservation of a few representative lines only, seeking references elsewhere when they fall outside these lines?

The idea of a comprehensive central reference library thus suggests itself. At present it exists, indeed, at the rooms of the Royal Astronomical Society; but space in London is limited and valuable, and the time may come when it must be sought elsewhere. The broad acres at Salcombe Regis may find a use of this kind. A case nearly analogous is that of astronomical photographs. There is in England no great reference store such as that at Harvard, where questions of astronomical history may be settled. Those of us who have profited by this great resource of Harvard have at times felt a little ashamed to draw on Transatlantic courtesy without doing something in return. The characteristic of any collection of the kind is growth—fairly rapid growth—and here again the broad acres have their attractions.

But these are visions of the future. Returning to the more practical present, we may remark that those who use the observatory should certainly include research students from the universities or elsewhere, especially those who may wish to become acquainted with the particular work being done at the observatory, as above outlined. The goodwill of the staff has already been manifested to one such student, and they are preparing to receive another. Here again there is an absence of prescribed conditions which can scarcely attach to universities themselves. They must in self-defence make conditions of joining the university, or some equivalent, which may not be convenient to the intending researcher. No doubt the Norman Lockyer Observatory will expect some *quid pro quo* if it is to continue to exist, but the conditions are as yet to be fashioned. It is for those who join the corporation, if they will, to determine, for instance, whether membership shall carry with it the possibility of recommending a friend to the privileges of the observatory, and on what terms; indeed, the possibilities are so wide that even to give representative instances may have the appearance of narrowing them. They might even include (though here we are venturing on rather dangerous ground) provision for the mere sightseer—the man or woman who "has never seen the moon through a telescope." This is scarcely possible with the present small staff, but if ways and means could be found it would be well worth while for other observatories to be among the subscribers to the corporation, if they could thereby transfer a part or the whole of their embarrassments from sightseers. It is worth remarking that the situation of the Norman Lockyer Observatory would probably attract this type of visitor, who naturally expects to climb a tower or a hill, and would not be disappointed. But we should prefer to lay stress on the more serious uses of the observatory.

The Oxford Expedition to Spitsbergen, 1921.

ORNITHOLOGICAL OBSERVATIONS.

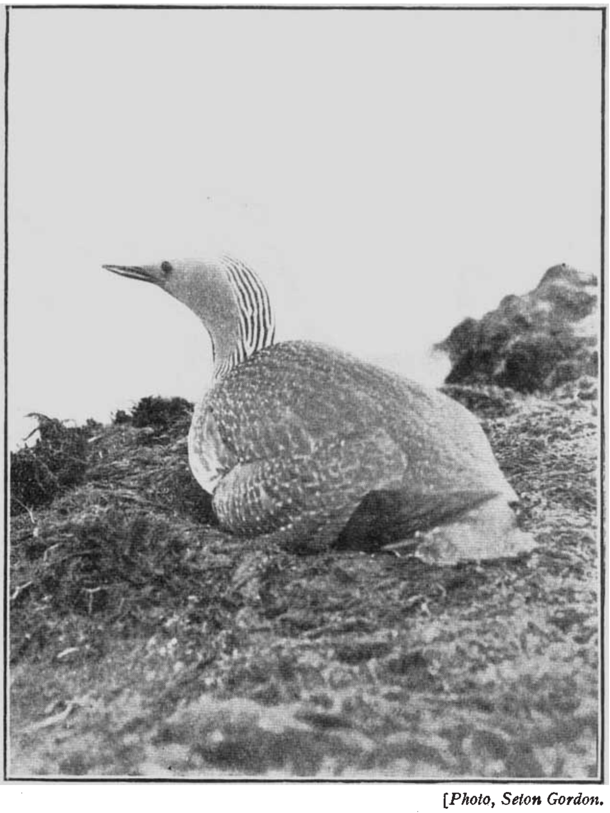
By the REV. F. C. R. JOURDAIN (Leader of the Expedition).

ALTHOUGH the collections made by members of the expedition have not yet been worked out, it is now possible to form some idea of the extent to which our knowledge of the Spitsbergen group has been increased by the Oxford Expedition of 1921. Owing to difficulties caused by industrial unrest both in England and Norway, the original plans had to be considerably modified, and it was agreed to carry out a biological survey of the southern half of Bear Island, with special reference to the ornithology, before proceeding to the west coast of Spitsbergen.

Practically no work of any importance in this field has ever before been undertaken by Englishmen, and no collections from here exist in any British museum. The only important works on the ornithology of this most interesting, but somewhat inaccessible, spot are Swenander's "Beiträge zur Fauna der Bären-Insel," published in the K. Svenska Vet-Akad. Handl., Bd. xxvi. (1900), and some passages in the great work of Koenig, "Avifauna Spitzbergensis" (1911). Swenander visited Bear Island in 1899, and recorded twenty-two species, while Koenig increased the number to thirty-six, but some of these rest on rather dubious evidence.

The northern half of Bear Island is flat, and covered with innumerable lagoons, but the southern half is hilly, and the coast line consists almost entirely of bold cliffs, which are the resort of millions of sea birds. It is this portion of the island which was investigated by the expedition. Two hitherto unrecorded breeding species were recognised in 1921, and both cases are of great interest as filling up gaps in the distribution of the species concerned. Additions were also made to the list of casual visitors, but more important was the acquisition of a series of nearly eighty skins of breeding species and more than 300 eggs from the island. Equally valuable are the biological notes on the share of the sexes in incubation, the courtship and breeding habits, of which very little has been recorded in the case of these Arctic species.

Actual work on the Spitsbergen group did not begin until June 25. Here, again, it must be remembered that the latest English work on the ornithology of Spitsbergen is Mr. Trevor Battye's paper in the *Ibis*, 1897, pp. 574–600. No series of skins from here with any pretension to completeness exists in any British museum. The eggs of the Barnacle Goose have previously been taken by only one expedition, viz. that of Prof. Koenig in 1907 and 1908, and the twelve eggs then obtained were the only wild-laid eggs known to science till the present season, when twenty-two eggs were obtained by the Oxford Expedition.



[*Photo, Seton Gordon.*

FIG. 1.—Red-throated diver on nest.

Mr. J. S. Huxley's researches on the courtship of the Red-throated Diver (*Colymbus stellatus*) (Fig. 1) and the Grey Phalarope (*Phalaropus fulicarius*) are referred to later, and need not be touched upon here.

In Mr. Trevor Battye's paper only twenty-nine species were recorded from all sources. Since then the total has been raised to fifty-three, and